Student and Teacher Perspectives on Spelling

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ABSTRACT

This paper employs a mixed methods multiple case study approach to offer an insight into strategy-use in the teaching and learning of spelling within an Australian primary school context. Eight low-achieving spellers and eight high-achieving spellers aged between eight and 12 years were selected following completion of a normed dictation task comprising 70 words. Spelling errors produced by the students in the dictation task and their narrative and expository written texts were then analysed to determine potential breakdowns in phonological, orthographic and morphological processing. Finally, semi-structured interviews with the students and their teachers were then conducted to further elicit strategy-use among the students and to capture interactions between the teaching and learning of spelling. Data triangulation revealed that the high-achieving spellers were able to flexibly draw on a range of linguistic strategies while the low-achieving spellers relied on a sounding out approach. The findings also highlight the importance of explicitly teaching students to develop a repertoire of strategies, including morphological processing, and a need for teachers to develop confidence and knowledge of the linguistic processes involved in spelling. Implications for the teaching of spelling emphasise a need for pedagogical content knowledge, and for teachers to use metalanguage and to integrate quality children's fiction and/or non-fiction texts when explicitly teaching spelling.

Introduction

Theoretical development and empirical research in the domain of spelling has largely drawn on quantitative methods, providing some valuable insights into how primary school-aged students learn to spell in Standard English (for review see Treiman, 2017a). Moreover, the focus has largely been on students enrolled in the initial years of formal schooling (e.g., Caravolas, Hulme, & Snowling, 2001; Ehri, 1999; Sharp, Sinatra, & Reynolds, 2008; Treiman & Kessler, 2014) and on sampling profiles associated with dyslexia (e.g., Bourassa & Treiman, 2001; Cassar, Treiman, Moats, Pollo, & Kessler, 2005; Richards, Aylward, Field, et al., 2006). The study reported in this article is the first to utilise a mixed methods design to explore the teaching and learning of spelling in the final four years of primary school and within an Australian context. This combined approach was designed to provide a broader picture of not just what students can achieve (in terms of accuracy) but how this relates to their perspective or understanding of the spelling process and their teachers' perspectives of how their students are performing in the context of the instruction methods utilised. In Australia, the primary years of schooling span seven years, with students generally commencing at about four and a half to five years of age. In this study, data triangulation of error analyses and semi-structured interviews of students and their teachers generated a rich description of the strategies used and articulated by low-achieving spellers compared with high-achieving spellers across Years Three to Six, aged between eight and 12 years. In this study, self-reports provided by the teachers and their students during the interviews revealed insights into the complexities of teaching and learning spelling. Their perspectives highlighted the role of the teacher in supporting student learning in spelling.

Conceptualising spelling strategies used by primary school students

The Overlapping Waves model is a theory of cognitive development which describes a process of learning where a variety of increasingly adaptive and sophisticated strategies are employed over time to solve domain-specific problems (Siegler, 1996). Via external instruction, feedback from the environment and a process of trial and error, over time children will increasingly understand how to select and apply the most appropriate strategy from a building repertoire (Siegler, 1996). There has been a growing focus into strategy-use in spelling. The Overlapping Waves (OW) model has therefore

provided a useful framework for researchers interested in exploring what strategies or procedures children employ when spelling and how these may change over time (Critten, Sheriston, & Mann, 2016) and has been applied predominantly in the first few years of schooling (e.g., Critten et al., 2016; Devonshire & Fluck, 2010; Farrington-Flint, 2015; Farrington-Flint, Stash, & Stiller, 2008; Sénéchal, Basque, & Leclaire, 2006; Sheriston, Critten, & Jones, 2016).

An initial study by Rittle-Johnson and Siegler (1999) followed 30 five-to-seven year old's longitudinally asking them to spell 30 regular words and self-report the strategies used. They uncovered a range of spelling strategies including automatic retrieval from memory and back-up strategies involving more deliberate processes such as:

- Sounding out only;
- Combination of retrieval and sounding out;
- Drawing analogies (thinking about another word's spelling as the basis for spelling the presented word);
- Relying on rules (e.g., the silent ***e*** rule for marking long vowels, or the *ing* or *ed* rule for inflected suffixes); and
- Visual checking (writing a word in multiple ways to help determine which version looks correct).

Other studies have demonstrated that not only do students show variety in their use of strategies when spelling but their choices become increasingly adaptive and influenced by their experiences as learners (e.g., Devonshire & Fluck, 2010; Farrington-Flint et al., 2008; Kwong & Varnhagen, 2005). Kwong and Varnhagen (2005) repeatedly tested (three times per week for four to seven weeks) 11 six-year old students and 34 adults to compare how they developed automaticity in spelling and noted a gradual shift from more overt strategies (e.g., sounding out), to automatised retrieval of novel (pseudo) words from memory, irrespective of age. They also argued that correctly spelled words can be produced via different routes. Furthermore, Farrington-Flint, Stash, and Stiller (2008) repeatedly tested three times in three months and found developmental shifts in 34 six-to-eight year-old's spelling strategies from phonological attempts to more consolidated orthographic strategies and

retrieval from memory; presumably due to the development of increasingly complex orthographic representations (Critten, Connelly, Dockrell, & Walter, 2014). Finally, it has been shown that more successful spellers tend to employ a greater variety of strategies more adaptively compared to poor spellers and that the relationship between strategy usage and spelling knowledge is largely determined by year of schooling and spelling experience (Critten et al., 2016).

Spelling error analysis has been used to help define developments in strategy-use in terms of 'stages' or 'phases'. For example, the Words Their Way Inventories (Bear, Invernizzi, Templeton, & Johnston, 2012) have been influential in many Australian school contexts, and imply a Piagetian notion of development (Frith, 1980; Kohnen, Nickels, & Castles, 2009), driven by an assumption that there is sequential increase in ability to represent written words over a series of five developmental stages. These stages have been labelled by Bear and Templeton (1998) as: i) 'emergent'; ii) 'letter name'; iii) 'within word pattern'; iv) 'syllables and affixes'; and v) 'derivational'. Their perspective suggests that spelling attempts are initially phonological representations (as reflected in the 'emergent' and 'letter name' stages'), followed by orthographically correct (as reflected in the 'within word patterns' stage), and eventually morphologically-informed (as represented by the final 'derivational' stage). However, as Treiman (2017a, p. 8) points out, 'a weakness of stage and phase theories is that they give short shrift to nonphonological knowledge, suggesting that such knowledge emerges only in the most advanced stage of development'. Similarly, Kohnen et al. (2009, p. 116) note 'that a child's spelling errors at a single point in time can reflect processing that would be attributed to several developmental stages' and they argue that 'there is no evidence that children move from one stage to the next by shifting from the signature strategy of one stage to the strategy that is characteristic of the next stage'. In response to a growing body of evidence supporting non-linear models of spelling development (see, for example, Bahr, 2015; Berninger, Abbott, Nagy, & Carlisle, 2010; Farrington-Flint, 2015; Garcia, Abbott, & Berninger, 2010; Treiman, 2017b), Daffern, Mackenzie, and Hemmings (2015) developed a spelling error analysis tool called the Components of Spelling Test (CoST) which captures phonological, orthographic and morphological applications in spelling without confining spelling ability into a particular 'stage' or 'phase' of development.

Previous research (e.g., Critten et al., 2016; Devonshire & Fluck, 2010; Farrington-Flint, 2015; Kwong & Varnhagen, 2005; Rittle-Johnson & Siegler, 1999; Sénéchal et al., 2006; Sheriston et al., 2016) has provided some insights into strategy-use in spelling but there are limitations which will be addressed in the present study: i) findings cannot be generalised to the strategies used by older primary school students; ii) studies have tended to prescribe the words to be spelled via dictation tasks rather than also considering words freely chosen within written composition; iii) studies have asked young students to self-report their spelling strategies but have rarely questioned them more broadly about how they approach spelling and have not integrated this alongside teacher perspectives on strategy usage and spelling instruction methods despite their likely relationship; and, iv) studies have not employed a mixed methods approach to explore measures of spelling accuracy and error analyses alongside student and teacher perspectives on strategy usage.

Spelling instruction

To some extent, students' spelling of words may improve over time through exposure and experience with reading words in texts (Treiman, 2018). However, learning to spell in standard English can be enhanced if students are explicitly taught the linguistic underpinnings of this language system (Graham & Santangelo, 2014; Treiman, 2017a, 2018). Yet, what constitutes effective instruction in spelling has been a controversial topic (Treiman, 2018). Amid the array of instructional approaches in spelling, rote learning of words, predominantly through a Look-Say-Cover-Write-Check process, has been popular (Herrington & Macken-Horarik, 2015). Another common approach has been informed by Piaget's research on the construction of knowledge and the view that learning to spell proceeds in developmental stages (e.g., Gentry, 2012; McNeill & Kirk, 2014). Adopting a pedagogy that draws on developmental stage theory means that teachers focus their instruction on phonological skills before introducing morphological (including etymological) aspects of the written language.

In Australia, the latest iteration of the national curriculum for English explicates the need for systematic phonics instruction, and this has aligned with mounting popularisation of commercially available phonics programs to support the teaching of spelling in recent years. Yet, Ehri, Nunes, Stahl,

and Willows (2012) provide compelling evidence from their meta-analysis of 38 studies that 'phonics instruction is not really effective for teaching spelling' (p. 205) for students in Years Two to Six (d = 0.09).

Further, a growing body of research suggests that successful learning in spelling may not be determined by nature and developmental maturity, but a product of the opportunities, instructional priorities and approaches that are afforded to learners (Kohnen et al., 2009). For example, Devonshire, Morris, and Fluck (2013) found that, following explicit instruction in morphology, etymology, phonology and form rules, five to seven year old students significantly improved spelling accuracy, more so than when phonics instruction was used. Similarly, Herrington and Macken-Horarik (2015) have demonstrated the value of explicitly teaching students in Years Three to Five to make connections between morphemes and phonemes in words. Neuro-cognitive research (Berninger et al., 2010; Richards, Aylward, Berninger, et al., 2006) and behavioural research (Bahr, Silliman, Berninger, & Dow, 2012; Silliman, Bahr, & Peters, 2006) has provided converging evidence that phonology, orthography and morphology are involved in learning to spell from the early years of learning to write. For example, in using fMRI as part of an intervention study involving students identified with dyslexia (n=10), Richards, Aylward, Field, et al. (2006) explored the ways in which those students coordinated phonological, orthographic and morphological processes when spelling. Other neuro-cognitive studies have involved comparisons of individuals with and without dyslexia, providing converging evidence that unique and common brain regions are activated when spelling (Berninger & Abbott, 2010; Berninger, Abbott, Nagy, et al., 2010; Garcia et al., 2010; Richards, Aylward, Berninger, et al., 2006). In a behavioural study, Bahr et al. (2012) analysed patterns of spelling errors produced by 888 students in their narrative and expository writing, providing evidence to support the view that establishing robust spelling involves learning to efficiently and accurately integrate phonology, orthography and morphology, and that there is considerable individual variability and nonlinearity in building these spelling skills among students within and across year levels.

The trajectory of learning to spell is largely dependent on how spelling is taught (Treiman, 2018). The view that young students can be taught to coordinate multiple linguistic processes (Daffern, 2016; Garcia et al., 2010; Richards, Aylward, Field, et al., 2006) opposes the assumption that instruction should broadly follow a sequential progression from phonology, to orthography, and eventually morphology. Meta-analytic research has also demonstrated that Standard English spelling can be effectively learned if explicit and substantial instruction is provided (Graham & Santangelo, 2014). This means that 'teachers must understand how the writing system works' and how to teach it (Treiman, 2018, p. 3). Nonetheless, previous research suggests that some teachers may not be prepared to adequately support student learning in spelling (e.g., Adoniou, 2014; Dockrell, Marshall, & Wyse, 2016; Fielding-Barnsley & Purdie, 2005; Moats, 2014; Stark, Snow, Eadie, & Goldfield, 2016). In order to enable developments in teachers' pedagogical content knowledge in spelling, and to clarify what kind of explicit teaching is most effective beyond the first few years of formal schooling, further research is needed.

The present study

The present study sought to integrate student and teacher perspectives of spelling (across the middle and upper primary school years) to identify: i) what strategies/approaches to spelling are reported by students who seem to struggle with spelling versus those students who are progressing beyond year level expectations; and ii) the kind of instruction methods that teachers employ and think may enhance learning in spelling beyond the first few years of formal schooling in order to form broader conclusions about best practice for struggling spellers.

The study described in this article forms one part of a larger mixed methods study which examined performances in spelling among Australian students in Years Three to Six (n=1,389). In the larger study, a pragmatic paradigm was embraced in the multifaceted inquiry whereby quantitative and qualitative methods were employed sequentially in order to understand a series of research problems (Creswell, 2012; Tashakkori & Teddlie, 2010). Within this paradigm, it was acknowledged that there may be differing interpretations of the data (Mackenzie, 2017; Mertens, 2015).

This paper incorporates the qualitative phase of the research, which was guided by Sproule's (2006) methodological framework for qualitative content analysis, as well as specific techniques described by Willis (2006) and Elo and Kyngäs (2008). The primary aim of this phase was to compare the spelling strategies used and articulated by eight low-achieving spellers and eight high-achieving spellers across the middle school years. The secondary aim was to explore interactions between strategy-use among the participating students and pedagogical issues in spelling, as revealed by the students and their teachers. As such, implications for the teaching of spelling could also be discerned. To address these aims, three research questions were explored. First, what spelling errors do the low-achieving spellers and high-achieving spellers make in words written to dictation and in freely composed written texts? Second, what spelling strategies do the low-achieving spellers use and articulate compared to the high-achieving spellers? Third, how can instructional practices impact on student learning in spelling?

Method

Participants

Based on the results of the quantitative phase of the larger study, eight cases became the focus of this multiple case study; with each case comprising one male and one female student to reflect the equal gender distributions that are generally present in Australian mainstream classrooms. The students are identified in Table 1 using pseudonyms. In total, sixteen students were purposively selected; eight were identified as low-achieving spellers (bottom third percentile) and eight as high-achieving spellers (top third percentile), based on their performance in the Components of Spelling Test (CoST), a real word dictation spelling task (Daffern et al., 2015). Selection of these two groups was further determined on the basis that the groups represented those students from the larger study who respectively performed below minimum year level expectations and above year level expectations in spelling, as determined by the National Assessment Program for Literacy and Numeracy (NAPLAN) (Australian Curriculum, Assessment, & Reporting Authority (ACARA), 2016). For all participating students, English was their first and only language and they were not diagnosed with a particular neurological or cognitive impairment, or with dyslexia. The students'

classroom teachers (n=16) were also invited to participate in this final research phase, which took place in the final term of the school year.

Table 1. Participating students

<INSERT TABLE HERE>

Measures and procedure

The following data sets were collected by the chief researcher (first author) at the relevant school sites:

Components of Spelling Test (CoST)

The CoST is a standardised dictation spelling test comprising 70 words. The design of this instrument was informed by Triple Word Form Theory (Richards, Aylward, Field, et al., 2006), and internal reliability results have ranged from .78 to .94 (Daffern et al., 2015). Predictive validity was evidenced in a subsequent study examining relationships between the Phonological, Orthographic and Morphological Subscales of the CoST and the NAPLAN Spelling Test (Daffern, Mackenzie, & Hemmings, 2017). The CoST utilises a spelling error analysis technique in order to determine the phonological, orthographic and morphological skills displayed. The students were required to listen to each word, presented in the context of a sentence, and then handwrite each word. The CoST scoring templates were used by the chief researcher to undertake the spelling error analysis.

Narrative and persuasive writing tasks

In line with the format used in the mandatory national Writing Test (ACARA, 2016), the researcher provided each student with a 30-minute narrative writing task and a 30-minute persuasive writing task. For the narrative task, the students were shown a coloured photograph of bushland, foregrounded by a small wooden carry case. The accompanying verbal instruction was: *Today, you will write a narrative. Narratives are also called creative stories. You have to write a story about the image seen on this photo. Look at the picture to help you with your ideas. This is the bush (point) and here you can see a wooden case (point). Think about where your story is set; who is in your story; and what is happening. You might like to think about why the wooden case is in the bush; who owns it;*

and what is inside it. For the persuasive task, the students were given a coloured image displaying symbols to represent the four seasons of the year. The accompanying verbal instruction was: *Today, you will write a persuasive piece of writing. Your topic is about the best season of the year. You need to write to convince a reader which season of the year you believe is the best. Remember to give reasons for your opinion and use paragraphs to organise your ideas*. Students were encouraged to be creative in their ideas; however, they were not assisted with the conventions of print, the generation of ideas and structure of the texts.

Strategy-use was illuminated by discerning the patterns of spelling errors in the students' writing. This parallels previous studies demonstrating that incorrectly spelled words can reflect breakdowns in phonological, orthographic and morphological processes (Bahr, 2015; Bahr, Silliman, & Berninger, 2009; Bahr et al., 2012; Silliman et al., 2006; Varnhagen, McCallum, & Burstow, 1997). Spelling errors from students' written compositions were analysed using the linguistic features of the CoST as a priori codes (pre-identified and deemed as significant according to existing literature) to elucidate potential breakdowns in phonological, orthographic and morphological processing. Inductive codes (additional or alternative codes that emerge) (Willis, 2006) were also developed if a spelling error did not fit within an existing construct in the CoST. This process was undertaken by examining and identifying the type of linguistic features present in all words that were incorrectly written by the students in the context of their written compositions. For example, additional orthographic error features emerged during this initial process, mostly concerning compound word boundaries, conjunctions and -l influenced vowels. Examples of these are provided in Table 2.

Semi-structured interviews

Semi-structured interviews with the students and their respective teachers were also conducted by the chief researcher to elicit strategy-use (see Appendix 1). Some of the questions were developed for the study, but others derived from questions that classroom teachers are typically encouraged to ask their students when they teach spelling (Topfer & Arendt, 2009). While the interviews were semi-structured in nature (Wilkinson & Birmingham, 2003), the questions were also guided by the words, phrases and spelling errors observed in students' written texts. Interviews with

the teachers focused on their instructional approaches in spelling and on their perspectives of how their students spell (see Appendix 2). All interviews were recorded and transcribed, and the form of transcription included verbal and nonverbal responses, including pauses and utterances (Willis, 2006).

Analysis

Frequencies of the students' spelling errors were computed to determine and compare their performance in the application of phonological, orthographic and morphological skills (Creswell, 2012). To assist with the interpretation of how the students performed in each subscale of the CoST, raw scores for each subscale were converted to show percentages of incorrectly spelled items (linguistic features). The number of words written by the students in their narrative and expository texts was also recorded, along with the percentage of whole-word spelling errors and the number of error types. These frequency calculations provided preliminary understanding of the strengths and weaknesses in spelling skills demonstrated by the low- and high-achieving spellers in this study. Individual variability among the participants was expected, in line with previous research demonstrating 'abundant variability, adaptive choice, and gradual change in strategy choice over time' (Farrington-Flint et al., 2008, p. 134). Thus, data analysis began with a preliminary inspection of the CoST results to ascertain differences in performance between the low-achieving spellers and high-achieving spellers in terms of phonological, orthographic and morphological errors. This was followed by an analysis of the written compositions and transcribed interview data, which involved a combination of a priori codes and inductive codes. The underlying tenet for the coding was that flexibility 'permits new, important material to be incorporated into the coding process' (Sproule, 2006, p. 124). By combining a priori and inductive coding, it was possible to include new codes as they emerged in the course of data triangulation (Sproule, 2006; Willis, 2006). The interview transcripts provided insights which could not be obtained through an analysis of the written compositions and CoST scores alone. Table 2 provides a summary of the initial codes that were generated from the written compositions and interview transcripts.

Table 2. Initial coding of qualitative data
<INSERT TABLE 2 HERE>

Results and discussion

Quantitative analyses

Table 3 shows the proportion of spelling errors produced by the students in each subscale of the CoST. The total number of incorrect items measured in each subscale of the CoST were converted to percentages for easy comparisons because each subscale of the CoST contains a different number of items. The error patterns produced in this dictation task provide some insight into potential breakdowns in linguistic processing when spelling. Results from the phonological subscale of the CoST suggest that phonological processing was less efficient and reliable for the low-achieving spellers in this study, as evidenced by the proportion of errors made (see Table 3). The errors were largely present in the medial parts of polysyllabic words, which parallels other research suggesting that encoding medial phonemes requires considerably greater processing skill than encoding initial and final phonemes, and that the cognitive load is greater when words are polysyllabic (Cassady & Smith, 2004; Cassady, Smith, & Putman, 2008; Larkin, Williams, & Blaggan, 2013). As polysyllabic words are generally morphologically complex, word length may not be the only factor explaining misspelling. As such, the analysis of spelling errors also accounted for the various linguistic features that make up individual words. For example, in the instance where the word 'irresponsible' was misspelled as 'ireposebel', numerous error types were noted. In this example, phonological errors were evident in the omission of some medial phonemes in the phonologically medial part of the word (-spons-) while the incorrect production of the assimilated prefix and the derivational suffix are indicative of a breakdown in morphological processing. As can be seen in Table 3, the results also show that phonological encoding was somewhat less problematic for the Year 6 low-achieving spellers in this study. This may, at least partly, be attributed to potential increases in working memory capacity in older students (Gathercole, 2007).

Table 3. Percentage incorrect of phonological, orthographic and morphological items, as measured by the CoST
<INSERT TABLE 3 HERE>

As shown in Table 3, stark differences between the participating low-achieving spellers and high-achieving spellers were evident in the orthographic subscale score of the CoST, with the

exception in Year 6. These differences suggest that the high-achieving spellers displayed heightened orthographic sensitivity. Kwong and Varnhahen (2005) contest that repeated experiences with new words helps to develop accurate orthographic representations. Indeed, the results of the CoST substantiate this view. Further, all of the high-achieving spellers in this study described their extensive and sustained engagement in reading, and this was affirmed by their teachers during the interviews. For example, Dom's teacher emphasised that *'he's* [Dom] *a very good reader … a very good reader'*, while Amy's teacher explained that *'Amy reads independently, and if she's got free time, she'll read'* and that *'the reading has helped her. Her success with spelling has a lot to do with constantly reading'*. Unlike the low-achieving spellers who were interviewed, the high-achieving spellers commented on their positive and extensive engagement in reading. For example, Jane stated: *'I do read a lot, so it becomes part of my mind that I have to know all of these words. Like, I read everything, like if there's a word, I pretty much read it. I read all the time'*. Similarly, Ed noted that he likes to read in his *'spare time'*.

Substantial differences in the morphological subscale scores of the CoST, between the low- and high-achieving spellers, were also noted (see Table 3), suggesting that the low-achieving spellers in the study were less likely to use morphological processing when spelling. Further, a high proportion of morphological spelling errors observed in the dictated words, especially among the low-achieving spellers, suggest that morphology is more difficult to master than phonology and orthography. This is consistent with Bourassa and Treiman's (2001) assertion that 'the ability to use some aspects of morphology in spelling takes considerable time to develop' (p. 177). It also aligns with other research showing that primary school students who make morphological connections when determining how to spell words are those who obtain higher spelling test scores than those who rely on phonological and orthographic strategies (Devonshire & Fluck, 2010; Treiman & Kessler, 2006).

An analysis of the students' written compositions revealed specific breakdowns in linguistic processing, as evidenced by the types of spelling errors, which in turn provided some insights into the strategies used by each student. As indicated in Table 4, the high-achieving spellers in this study made fewer spelling errors than the low-achieving spellers at each year level, suggesting that the spelling

strategies were more robust among the high-achieving spellers. Higher proportions of word errors observed in the low-achieving spellers' written compositions also suggest that the low-achieving spellers were limited in their capacity to create meaningful written texts, when compared to the high-achieving spellers.

Table 4. Spelling errors in written compositions
<INSERT TABLE 4 HERE>

Qualitative analyses

By triangulating all data, comprehensive profiles for each student were developed, and a total of 16 spelling strategies emerged. Each strategy was then classed into one of five overarching categories (see Appendix 3), namely (i) phonological processing (P1-P3); (ii) orthographic processing (O1-O4); (iii) morphological processing (M1-M3); (iv) linguistic cross-mapping (X1-X4); and (v) behavioural (B1-B2). Table 5 provides a summary of the 16 strategies used and articulated by the students. While there are overarching differences between the spelling profiles of low-achieving spellers and high-achieving spellers, the results also illustrate that there is individual variability in strategy-use among the participating spellers.

Table 5. Summary of spelling strategies: Low-achieving spellers and high-achieving spellers
<INSERT TABLE 5 HERE>

Strategy-use among the low-achieving spellers

The low-achieving spellers in this study relied heavily on phonological processing and demonstrated a limited repertoire of spelling strategies. The 'sounding out' strategy was the dominant strategy used and articulated:

> **Researcher:** *What do you do when you write a word that you're not sure how to spell?*
>
> **Mick:** *I sound it out*
>
> **Bob:** *I would sound it out and see how much letters it has. … Try and count how many sounds … I think about what the sounds are and try and sound it out.*

Although the low-achieving spellers relied on 'sounding out' words, this strategy was not always executed accurately. Phonological difficulties were especially reflected in the misspellings of phonologically regular medial parts in polysyllabic words. For example, in Lucy's persuasive text, the words 'pollinating' and 'pollinated' contained a missing syllable and were misspelled as 'polanting' and 'polanted', respectively. Indeed, phonological working memory is one of the core skills needed for accurate phonological processing, and poor phonological processes can be reflected in syllable-level errors. Working memory may therefore contribute to phonological encoding difficulties.

Difficulty with phonological encoding of polysyllabic words was also implicitly conveyed in the interviews by the low-achieving spellers:

> **Bob:** *Big and long words are hard … when the words get larger and larger … I would sound it out and see how much letters it has. … I try and count how many sounds … I think about what the sounds are and try and sound it out.*

> **Rose:** *The words with lots of letters – those ones I find tricky to sound out, yeah 'cause I can forget where I'm up to in the sounds. But I can get the first part mostly.*

The teachers confirmed a prevalence of 'sounding out' among the low-achieving spellers, as exemplified below:

> **Dom's Teacher:** *I've got two quite low spellers … you can read what they write because it's all phonetic, all phonetic. … Sounding out is the only strategy the low spellers use.*

> **Rose's Teacher:** *The sounding out approach is what she uses, but it doesn't always work. She needs to work on clapping the syllables.*

Orthographic strategies among the low-achieving spellers were mainly evidenced through a seemingly small bank of high-frequency words that could be automatically retrieved from memory to spell when composing written texts. This was further evidenced in the interview data:

Lucy: *Well, we do Look-Cover-Write-Check, so each week we write our sight words. We do them nearly every day. I try and remember them to help me with my writing. Like, I just know that word.*

Bob: *I just really try and stick with words I know.*

Harry: *Sometimes I just try and use my word lists 'cause I just remember them.*

Kate: *I know some words, so you know, I use my memory of what words look like.*

The low-achieving spellers in this study displayed limited morphological knowledge. This was reflected in the morphological errors they made (e.g. Gabby produced *blockte* instead of *blocked*). Moreover, these students did not demonstrate overt understanding of the relationship between affixes and base words/roots (Apel, 2014). Indeed, there was a complete absence of meaning-based strategies articulated during the interviews with the low-achieving spellers.

Strategy-use among the high-achieving spellers

The high-achieving spellers in this study demonstrated a broad range of strategies, were able to adapt strategy-use flexibly, and in most instances, could articulate strategies using sophisticated metalanguage:

Jane: *I use my phonological knowledge and my orthographic knowledge. … At school, my teacher uses picture books and we have been learning about different 'knowledges'. Right now we're focussing on orthographic knowledge … and my teacher points out different letter patterns.*

Dom's teacher also illustrated the notion of adaptable strategy-use as a key point of difference between low-achieving spellers and high-achieving spellers:

Researcher: *So, you said that your lower-achieving spellers are sounding out? And your higher-achieving spellers?*

Dom's Teacher: *Yes, but the high spellers also even look at the roots of words and which words relate and how they, you know, the word, how do you say it? .. word building, I suppose. So, when we're doing the morphological side of it, they're able to do that, and when we're doing the etymological side they're doing that, but they can do both when they need it. Whereas, the others* [low-achieving spellers] *are just doing the phonetic.*

The high-achieving spellers were conscious of morphemic elements in words and could draw on semantic features to help them spell less familiar words:

Dom: *I would think of phrases that you would use it in. … There can be other ways to use 'past'. Like there's future and there's past, so* [states the letter names] *p, a, s, t instead of* [the letters] *p, a, s, s, e, d. … 'Passed', would be as in, he passed me as he was walking through the street.* [Correctly writes the word, 'passed']. *… Grammar is part of spelling … because grammar has to do with the words and how you write them and how you use them in a sentence, and so is spelling.*

Ed: *… thinking of a sentence that goes with it and seeing if it makes sense.*

Fred: *Well, the root word is 'zoo' and then the '-ologist' part would be a scientist, so adding it on would make it a person who studies something to do with the zoo, which of course is animals.*

Fred's Teacher: *The high-achieving spellers usually just have that base knowledge of the key words, like the base words. So, they know those rules about, you know, adding …* [the letters] *t, i, o, n and all of those. So, they can rely on their knowledge and put it into practice. Whereas, the lower spellers probably don't have all of those strategies in place. … So, they don't make the connection that a meteorologist studies meteorology. So having a more sophisticated ability to look at a word and say, oh, that's what it means and all these words belong to it.*

Heightened orthographic sensitivity among the high-achieving spellers was also evidenced in the interview data. These spellers were conscious of environmental print and used this visual information to help them with their spelling:

> **Rose's Teacher:** *Higher spellers are much more aware of the environmental print around the room and so they'll know where they might have seen that word and go and search it out.*

> **Fred's Teacher:** *I said* [to Fred]*, look, there is a word on here that's not right. I didn't tell him which one and he immediately saw it, so he was able to identify it. … He just knew. He saw it on the page and said, it's that word and I missed the* [letter] *e, or whatever it was, straight away.*

The data from this study suggest that general word knowledge, exposure to print and morphological awareness may play an important role in a student's ability to spell new words. As one illustration, Dom's teacher commented that her high-achieving speller, Dom*, 'is fascinated with countries and languages. … He is interested in finding out how words come about, where they come from. … He does have good vocabulary and he loves reading*'. With an increase in vocabulary knowledge, a reliance on effortful, strategic encoding diminishes. Nonetheless, a weakness in phonological encoding may be masked if general word knowledge and/or morphological awareness is strong. Furthermore, while some writers may be able to adapt their strategy of choice when spelling less familiar words, spelling accuracy may also depend, to some extent, on the context for spelling (e.g., dictation of prescribed words vs. free composition, or narrative vs. expository text types).

Pedagogical issues

While the small sample size of this study makes it difficult to generalise strategy-use to other contexts, the triangulation of data has also revealed a number of pedagogical issues pertinent to spelling. What follows is a description of the pedagogical issues that emerged.

While some teachers may genuinely find it difficult to dedicate time for spelling instruction, it seems that the teaching of spelling is not always considered to be a priority:

Harry's Teacher*: … it* [the teaching of spelling] *wasn't outweighing some of the other elements of English curriculums. … I don't really teach it.*

Ian's Teacher: *The workbook* [commercial phonics text] *is quite independent because of time constraints and they're trying to get through all the activities for the week.*

Despite apparent issues surrounding time constraints and perceived values in spelling instruction, the students could have benefited from some explicit instruction in spelling. Where the provision for daily spelling instruction appeared in some classrooms, it did not necessarily include explicit teaching of linguistic skills and spelling strategies. Rather, instruction entailed reading aloud and explaining task requirements or questions specified in spelling workbooks. Yet, prescribing instructions for the completion of workbook activities is unlikely to equate to adequate instruction in spelling:

Researcher: *When the students in your class talk about the way they go about spelling, what spelling strategies do they use? Have you been able to determine whether they can articulate any strategies?*

Ian's Teacher: *I think they just rely on sounding out, and they say things like, 'I know how to spell that', or they either know it or they don't. Umm .. there is more conversation about the activity than about the way the word is spelled and the linguistics behind it. So, our conversations are activity-based, as in book-based. So, whatever task they're doing at the time is what the chat is about, rather than the actual rules behind spelling.*

The data also suggest that teachers who lack confidence and have minimal knowledge of the linguistic processes involved in spelling are more likely to limit strategy instruction to 'sounding out' or they may lack strategic instructional approaches. A teacher who lacks knowledge about the linguistic processes involved in spelling may also find it difficult to understand the strengths and weaknesses in their student's spelling. Yet, restricting instruction to phonological-based strategies or

not systematically teaching other linguistic skills such as morphology, severely limits the capacity for low-achieving students to learn how to spell complex words:

> **Kate's Teacher:** *If they're poor spellers, like Kate, I ask her: how do you pronounce this? how do you write this sound? and then try to lead them towards sounding it out.*
>
> **Chloe's Teacher***: I'm getting them to hear the sounds in words.*
>
> **Mick's Teacher:** *Telling the kids that, and the kids seeing that, I am a shocking speller … and the fact that I make errors.*
>
> **Amy's Teacher:** *I'm honest with the kids and I tell them that I'm not literacy minded. So, I talk to them about how I'm not a very good speller.*
>
> **Ed's Teacher:** *It's the same kids doing really well and the same kids that do poor. … There hasn't been an increase in the results. Having said that, I haven't been putting a big focus on the tests because I have been trialling different things. But, yeah, it's the same kids scoring low and the same kids scoring high. … like I said, I'm still battling with spelling a bit.*
>
> **Researcher:** *Can you tell me some of the strategies that you have observed Ed use when he is spelling?*
>
> **Ed's Teacher:** *… Oh, that's tricky … umm … he's a bit of a rusher. … He is quite messy and, I don't know … I don't know.*

On the contrary, and as exemplified by Jane's teacher, pedagogical content knowledge and teacher confidence is an enabler for the explicit teaching of a broad range of strategies. As evident in the transcript below, Jane's teacher was confident teaching in the domain of spelling, and she provided comprehensive daily learning experiences for her students while also utilising children's fiction and non-fiction texts as a resource to teach spelling. These conditions appear to have had a positive impact on the development of spelling knowledge among the students in the class.

Jane's Teacher: *I really do explicitly use the language with the kids each day. I talk about orthographic knowledge, the phonological knowledge, the etymological knowledge or the morphological. … So, generally, in a given week I'll focus usually on one or two strategies a week. Sometimes I mix them up a little bit because obviously they're using multiple strategies, but at the start of the year, I would very explicitly say, ok this is morphological knowledge because we're looking at suffixes. … The kids know that the learning intention for spelling is that we are trying to learn to use a variety of different strategies to spell. And I will go, ok this is what we are going to do: what strategy do you think we're using; what knowledge? and we can talk about it. … I am noticing that they're using the strategies a lot more. They're actually able to say, well hang on a second, I know that I have to double the letter; they're thinking more about their spelling and the meanings of words, which is helping them. … I'm finding that with my really low spellers, they're really moving on. That is really helping them a lot.*

Conclusion

The study triangulated self-reported data from students and their teachers along with spelling error analyses of words that the students spelled to dictation and in their compositional writing. Rich descriptions of the spelling strategies emerged and demonstrated that the low-achieving spellers made more phonological, orthographic and morphological errors compared with high-achieving spellers, and the difficulty with morphological processing was particularly marked. Furthermore, both student and teacher reports confirmed that while the low-achieving spellers were able to draw upon few strategies effectively when spelling, and that phonological approaches predominated, the high-achieving spellers drew upon phonological, orthographic and morphological strategies more successfully and flexibly. One of the issues that may prevent weaker spellers using more strategies is because the cognitive load may be too great if they are still struggling with remembering all the phonemes in polysyllabic words during the encoding process. Other issues surrounding difficulty with the variety of strategy-use among the low-achieving spellers could be explained by potential problems with working memory (Adams, Simmons, & Willis, 2015); problems with explicitly knowing when

and when not to apply specific skills; or simply an absence of knowledge of the different strategies that can be employed to spell unfamiliar words (Critten et al., 2016). Limitations in strategy-use may also be a result of how thorough the spelling instruction has been. That is, if the students have been struggling with their learning in spelling, instructional attention in phonics may have outweighed instruction in morphological and orthographic strategy-use.

Insights from the teachers and students in this study also resonate with the view that general word knowledge, exposure to print and morphological awareness play an important role in a student's ability to spell new words (Apel & Lawrence, 2011; Conrad, Harris, & Williams, 2013; Kim, Al Otaiba, Puranik, Folsom, & Gruelich, 2014). Richards, Berninger, and Fayol (2009) are justified in explaining that an 'autonomous orthographic lexicon' can become established when 'durable, multifaceted … representations can be directly and … automatically accessed' (Richards, Berninger, & Fayol, 2009, p. 328).

An examination of pedagogical approaches to spelling also provide instructional implications, although the findings are limited in their generalisability as they draw on data from a small sample of students. First, teachers need to understand individual strengths and weaknesses in their students' spelling as this will inform instructional priorities. Hence, regular and varied forms of assessment are needed. These may include spelling error-analyses of dictated and free writing, or student-teacher conferencing in the form of interviews, journal entries or questionnaires. Standardised diagnostic assessments are also useful (see, for example, Daffern et al., 2017; Kohnen, Colenbrander, Krajenbrink, & Nickels, 2015), and could include a combination of real word and non-word (pseudo word) spelling to determine which linguistic skills require instructional attention for individual learners.

Explicit and regular teaching of word-formation processes is also critical. Although not all teachers in this study appeared to explicitly teach spelling on a regular basis, meta-analytic research has shown that significant improvements in spelling can be made by increasing the amount of explicit instruction (ES=.70) (Graham & Santangelo, 2014). Teaching students to coordinate strategies that

encompass phonological, orthographic and morphological aspects of the written language supports vocabulary development as well as reading and writing skills (Bahr, Silliman, Danzak, & Wilkinson, 2015; Farrington-Flint, 2015). In order to sustain individualised explicit instruction within regular classroom settings, mini-lessons with small groups of students may be needed (Daffern, 2016). Some instructional examples follow.

If a group of students in a class displays difficulties with phonological processing in polysyllabic words, a teacher could begin by asking the students to locate three-syllable words, four-syllable words and five-syllable words present in children's fiction and non-fiction literature. The students could then write and categorise those words according to the number of syllables in each word. They could also identify the stressed and unstressed syllables and identify the number and type of phonemes in each syllable.

If a group of students needs to learn specific orthographic regularities, a teacher could provide opportunities for the students to examine the linguistic properties within target words to determine any positional constraints and the respective generalisations. An example may be in relation to knowing when to use '*dge'* (as in 'bridge'), 'j' (as in 'jug'), and '*ge*' (as in 'stage'). Through an inquiry approach, students could discover that the trigraph (three consecutive alphabetic letters representing one phoneme), '*dge'* never appears at the start of a word. Rather, the trigraph, '*-dge',* is usually used when its corresponding phoneme comes right after a short vowel phoneme (for example: *bridge, dodge, gadget, edge, dredge, fudge, judge, badge, nudge, lodge*). On the other hand, the digraph (two consecutive alphabetic letters representing one phoneme), '*-ge*', is used when its corresponding phoneme comes right after a long vowel phoneme, as part of a split digraph, or after the letter 'n' (for example: *stage, rage, wage, oblige, range, strange*).

Regarding an aspect of morphology that may be of concern, if a teacher recognises that a group of students is incorrectly applying the derivational suffixes '*-ion'* and '*-ian'* in the production of words, the students could inquire into the linguistic properties of specific target words and their derivatives in terms of their meaning and function. For instance, with careful teacher scaffolding,

students could deduce that words ending in '*-ian'* refer to people (for example: *dietician, physician, musician, historian, Indian, magician*) while nominalised verbs ending in '*-ion'* are abstract and do not refer to people (for example: *compete-competition; protect-protection; confess-confession; revise-revision*).

Teachers require linguistic knowledge in order to correctly model the metalanguage associated with spelling (Moats, 2014). As observed in this study, a teacher's knowledge of the linguistics in spelling appears to influence how spelling is taught and how spelling can be learned (Treiman, 2018). This observation parallels Chen and Myhill (2016), who construe that if teachers are confident in their subject knowledge 'they are likely to enable faster and richer development of metalinguistic understanding', whereas if teachers 'are less secure in their subject knowledge …, learners' metalinguistic development may progress at a different pace and their ability to elaborate, extend or apply that metalinguistic understanding is likely to be hindered' (p. 107). Hence, schools could invest in ongoing professional learning as this may be useful in ensuring teachers are confident in using relevant terminology. Professional learning in schools should also feature opportunities for teachers to observe exemplar spelling lessons and to critically evaluate explicit teaching practices. Pre-service teacher education courses should also include thorough training in linguistics.

Finally, schools should aim to develop a consistent pedagogical approach in spelling. This might include the development of a common theoretical view about how school-aged students learn to spell and ensure linguistic terminology is consistently used across schools. Schools should also agree on consistent formative and summative assessment practices that involve systematic error analysis of words produced in freely written compositions as well as from dictation. As illustrated in this study, valuable insights about student and teacher needs in spelling can also be obtained from structured conversations with the students and the teachers. Considering such feedback can help schools to identify teaching and learning priorities in spelling, we welcome school teachers to include (and adapt) the interview schedules provided in Appendices 1 and 2 within their assessment practice.

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Appendix 1 Interview schedule for students
<INSERT APPENDIX 1 HERE>

Appendix 2 Interview schedule for teachers
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Appendix 3. Final coded repertoire of spelling strategies and their definitions

<INSERT APPENDIX 3 HERE>